

Interesting Musical Moments Illustrated: A Visualization Project

By Students in MUS 243 at the University of Illinois Urbana-Champaign

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Note: The selections are limited to 30-second length, which is an agreed upon limit to stay within "fair use" copyright guidelines. In addition, the samples are reduced in quality (mp3 format) and are shared in the context of education and commentary upon the works. For more information, see: http://en.wikipedia.org/wiki/Wikipedia:Music_samples. Adobe Reader is the recommended viewer for this pdf. Most other pdf readers will allow you to hear the audio when you click the headphone icon.

Interesting Musical Moments Illustrated: A Visualization Project

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Assignment: visualizations for our first book, “Interesting Musical Moments Illustrated”,

This assignment will allow you to visually represent a short segment of music using Audacity and Microsoft Word (or Open Office). Visualizations give us an opportunity to see music in new ways, potentially opening us up to understanding different relationships. Perhaps most importantly, visualizations that are automatically generated from recordings, as you will do with this assignment, can be used to quickly create “scores” of music when sheet music is not available (improvised music, hip-hop, pop music in general, etc.). We will publish the finished work somewhere (for those who wish to share). Here are the parameters:

- You should work with a meaningful sample of music (15–30 seconds).
- Your visualization can be a representation of any music you choose, but should be a piece of music you are interested in better understanding.
- Remember Gregory Bateson’s words, “Information is a difference that makes a difference.” Find a meaningful way to represent the music by exploring multiple possibilities. We want to provide ourselves and our students with information from the visual world to enhance our listening experiences.
- In addition to visualizing the music, you will need to describe what you have learned and what the visualization shows by providing text aimed at a potential student reader.

Essential Skills and Programs

Audacity: you can work with Audacity in the lab, but as this is a free program you should seriously consider installing it on your home machine. I could not teach music without it. Download the most current beta version (right now, 1.3.11) and you should consider installing the LAME library to export mp3, and also extra plugins for effects.

Microsoft Word: You’ll use the “templateforvisualization.doc” to complete your visualization for submission.

Screen Captures: in order to embed your visualization and a Word or other document format, you need to be able to capture the image on your screen. See next page.

PDF Creation: as before, easily accomplished using the “Print” command on a Mac or something like “Ghost pdf” on Windows.¹

Introduction

This visualization project first came to us as students in Music 243. The first part of this assignment was to choose any song and create spectrum visualization for it in Audacity. After doing this, we were to choose a 30 second clip and analyze our selection. This part was very interesting because it allowed us to view our song from a whole different angle, analyzing not only the song as we heard it, but as we “saw” it as well. After this, we were to put our 30-second visualization into a word document, highlight important points, and also create a flac file to present the 30-second clip. We experienced the project ourselves, chose our very own songs, and met all the requirements associated with it.

The Process

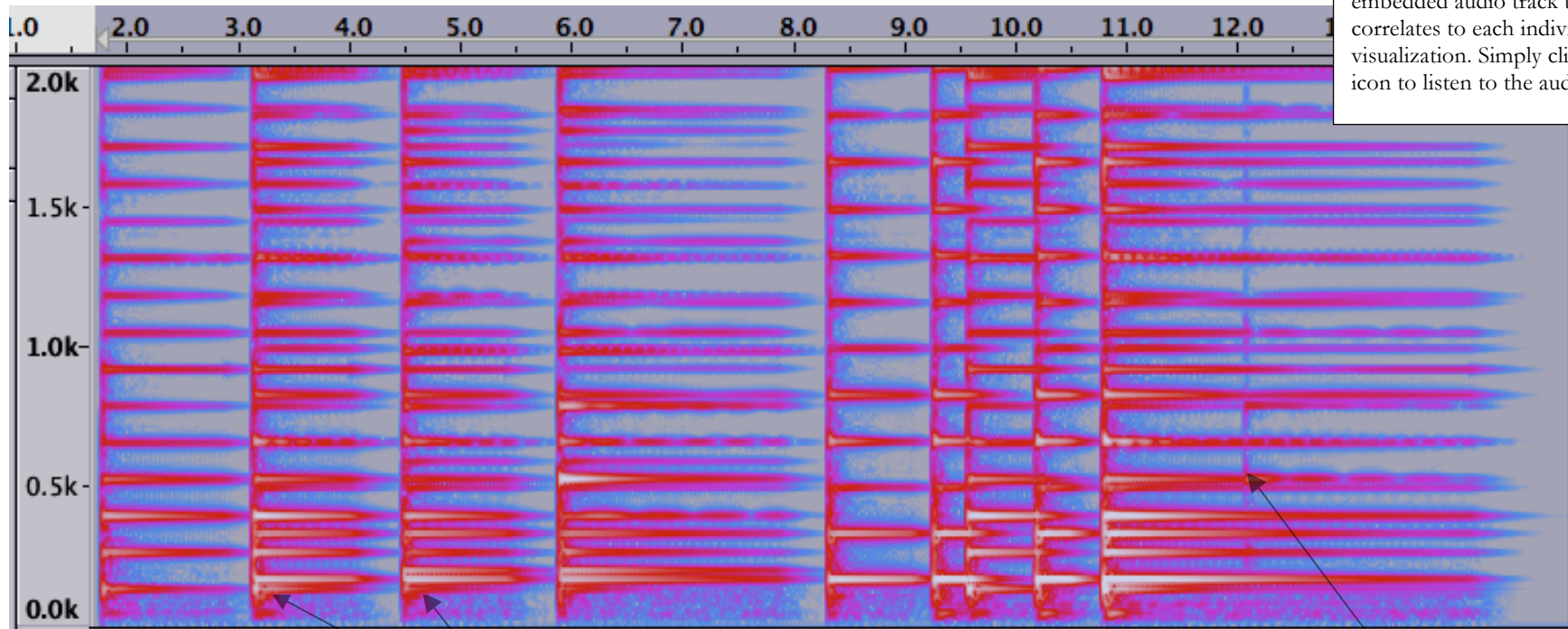
In order to create this visualization book, we had to go through a plethora of visualization projects and analyze their strong and weak points. We listened to the 30-second flac file and made sure its respective visualization was of high quality and gave sufficient analysis and description. Overall, we ended up going through about 6 classes spread throughout the duration of 3 semesters. Once we finished looking at the projects, we had to choose which ones we considered exemplary and include them in our visualization book. Although the ones we chose were all good, we edited some and enhanced others in order to make them just right for our book. From this point, we embedded the mp3 files into their respective visualizations, providing us the content for our book.

Overall, we really enjoyed hearing and viewing all of our peers' different visualization projects. It allowed us the opportunity to learn more about our fellow classmates as we observed their work, music selections, and thoughts. Also, it was very interesting to view a spectrum of their song, analyze it, and then view their analysis as well. This gave us more points of view and really opened the possibilities of the song more. Lastly, we ask that when you view this book, you make your own analysis about the songs and spectrums, allowing you to get the most possible out of our work. We hope you enjoy this as much as we did!

How to Read a Visualization: An Introductory Guide



This page is meant as an introduction to the following more complex visualization project pages. This is a sample visualization of a few notes and chords. Below are a few tips when looking at the other visualizations.



The Headphone icon has an embedded audio track that correlates to each individual visualization. Simply click the icon to listen to the audio track.

These texts are students' observation on the audio sample they have chosen. Students are instructed to note interesting patterns within their visualization.

Students indicate interesting patterns, fluctuations, and contrasts via arrows. For example, in this recording, the played notes are noted in yellow.

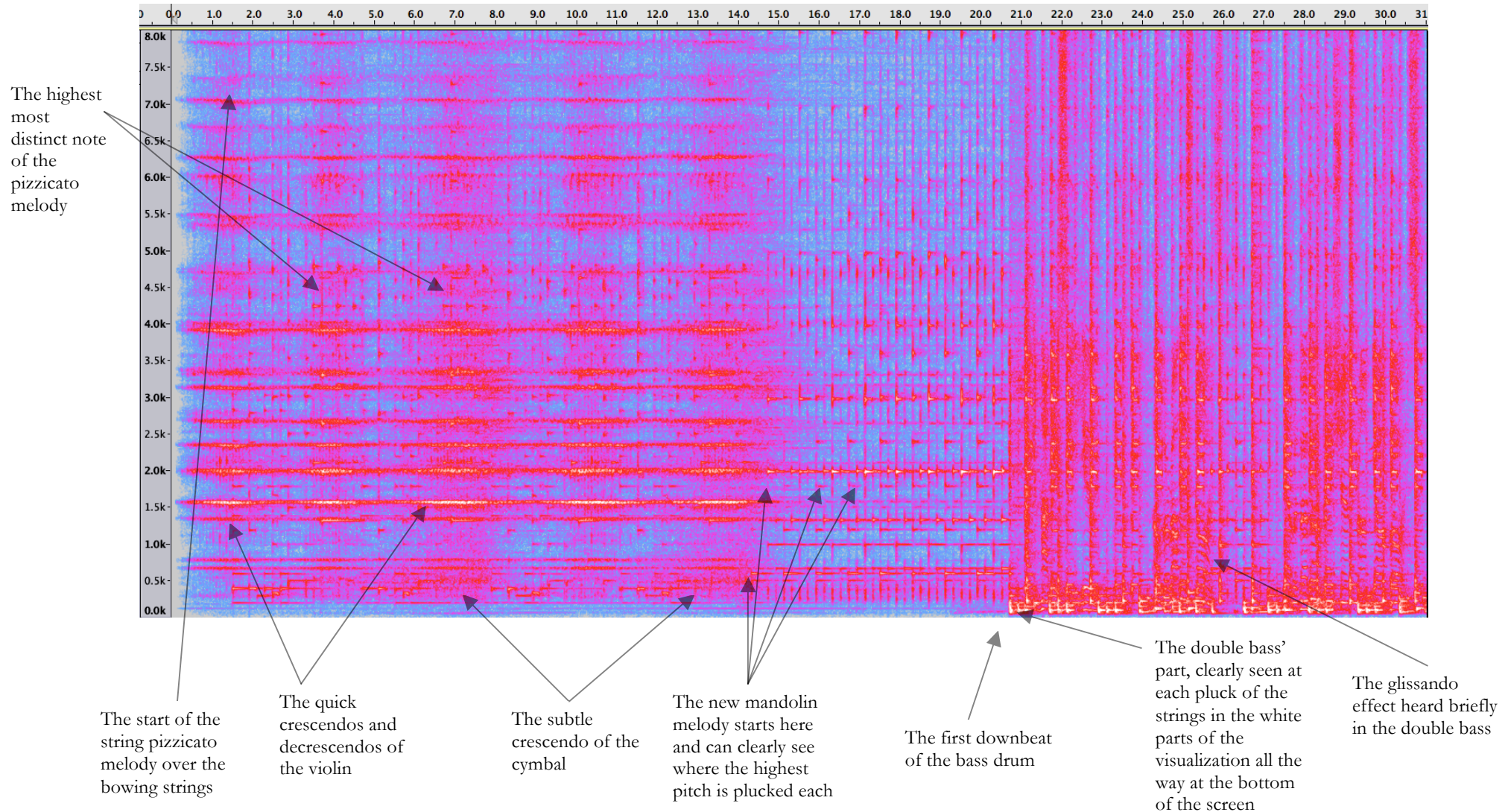
In some cases students discover a note or phrase that they would not have noticed if not for a visualization.

Below is the copyright information related to each of the student's visualization. Student's visualizations includes the name of the student, title of song, name of artist, album, location of recording and recording date.

Luminol by Miracles of Modern Science



This band Miracles of Modern Science is an interesting band because of the instrumentation that they use in their songs. Their instrumentation of double bass, cello, violin, mandolin, and drums makes for a different kind of song in most modern music. Because of the unique instruments they use, I thought a visualization could be very interesting. The first thirty seconds of the song seemed ideal to use because listeners can definitely hear all the different parts of what makes their band so unique.

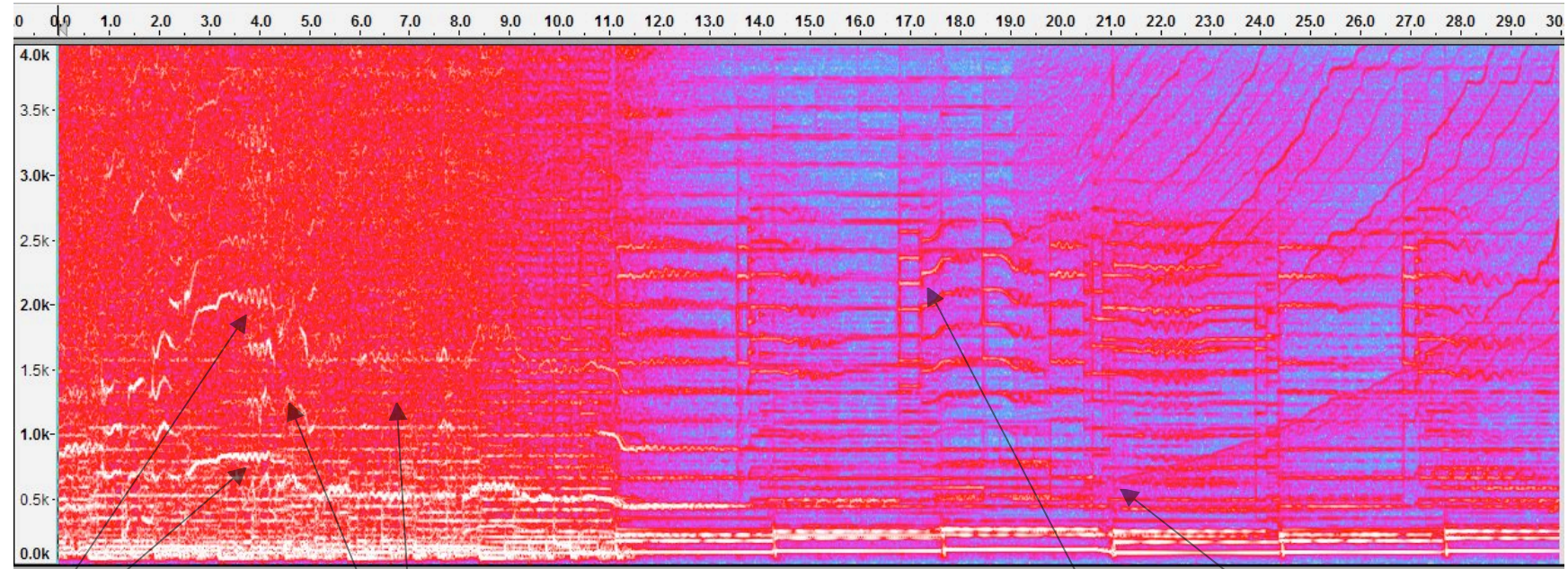


© 2009 Visualization by Brigid Baker. Hirshfeld/Younger. (2008). Luminol [Recorded by Miracles of Modern Science]. Miracles of Modern Science [CD]. Princeton, NJ: Unsigned.

Citizen Erased by Muse



For this project, I decided I would pick a song by Muse, for a couple of reasons. One reason was the lead singer, Matt Bellamy. He has a unique singing style, employing a high vocal range and a distinct vibrato, which I thought would possibly look interesting on a Spectrogram. Another is for some of the extra sounds and effects the band adds to their music. I found this clip to be a small taste of both of these characteristics.



Here are some examples of the lead singer's vibrato.

When the vocalist is using his fuller-sounding chest voice, overtones show up more brightly on the graph, compared to when he is using his head voice.

At this point, there is an immediate drop in volume, including a visually noticeable decrease in the use of percussion. The area of the graph once cluttered by the sound of the drum set now reveals the contour of the bass line.

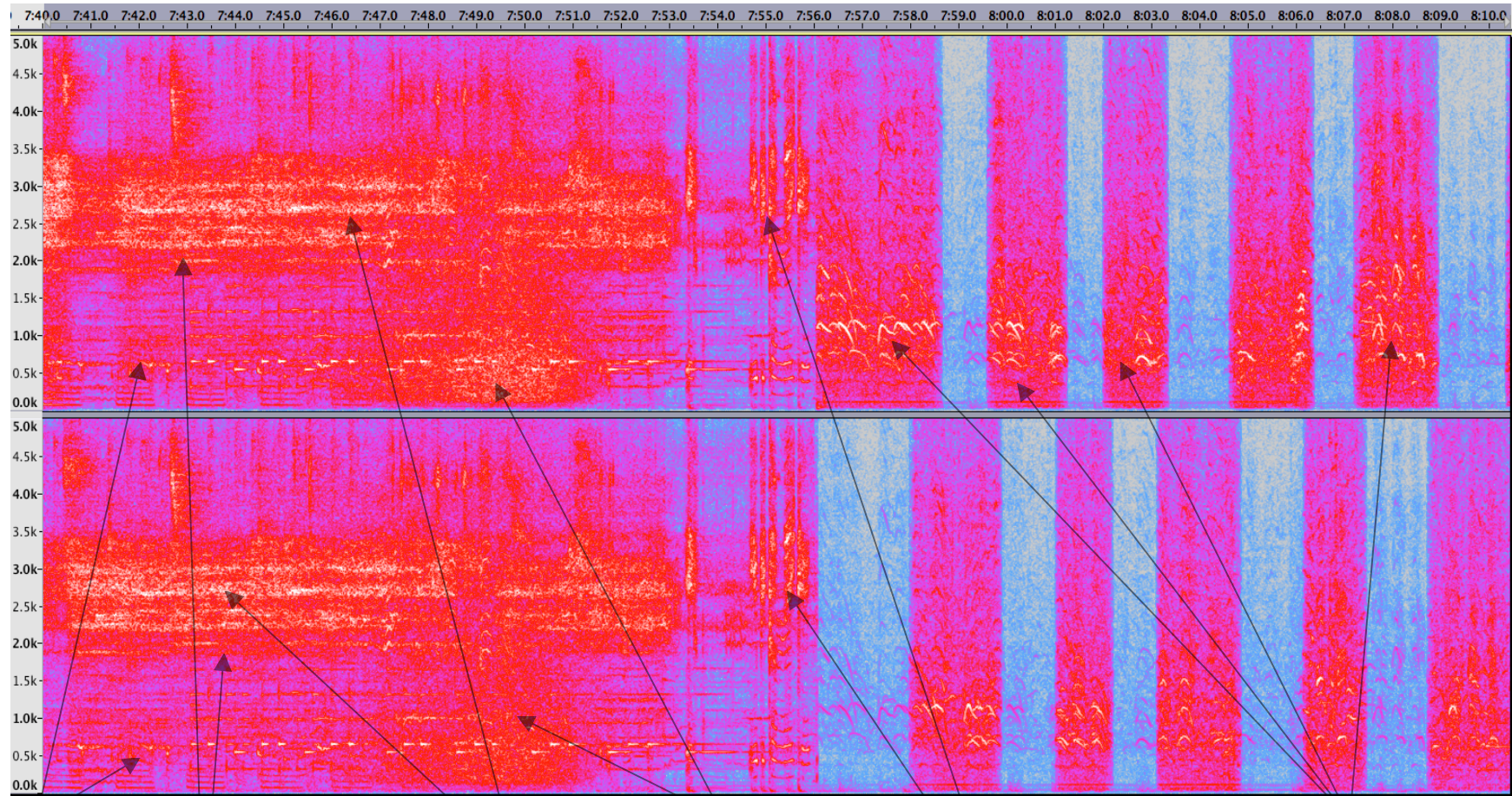
The graph depicts the pitches being played by the guitar, including the pitch bending in the melodic line.

Here, you begin to hear an electronic sound effect, something like the sound of small gears turning, slowly rising in pitch

Revolution 9 by The Beatles



When beginning this assignment, I chose to pick a song that had many loops and overdubs all over it, in order to be able to hear some tracks that an ear would normally never hear. So I chose to pick a song that has interested me very much, not because it is pleasing to my ear, but because I enjoy discovering new things and attempting to learn some new aspects of a band that I love or a song that I do not fully understand. In addition, I chose to include both channels because the interaction between the ears is very interesting to me.



Here you can hear piano in both channels.

Right below the large blob of red and yellow, there is a narrow line of yellow. This is the voice track.

This is the white noise and ambiance behind all of the tracks.

This section sounds as if a wave is engulfing the whole piece.

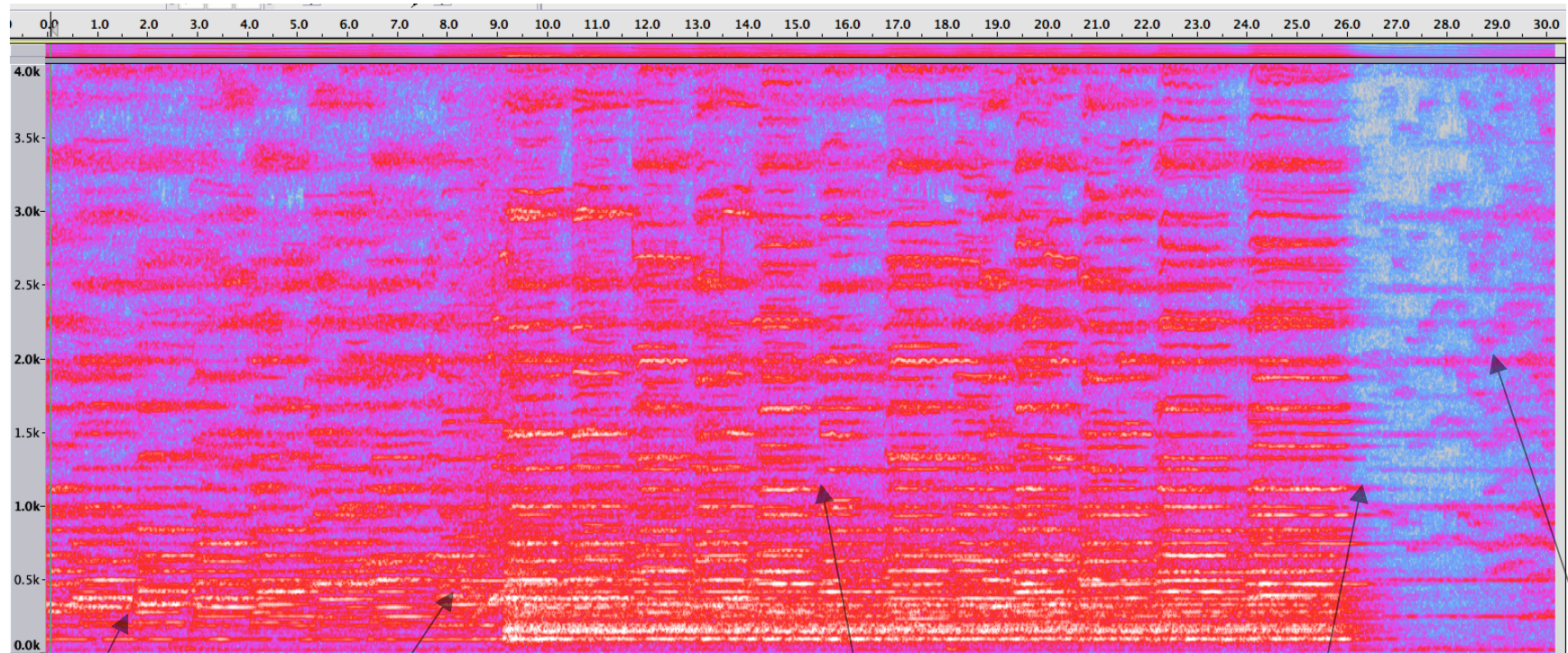
Voice says, "And you become naked" and immediately the right channel goes silent.

Continuing here, you can see the audio go from the different channels, however, the loudest sections of each isolated channel will be still hear in the silent channel. This can be seen by the red marks in the blue background

Finale from The Firebird Suite by Igor Stravinsky



I have always been intrigued by this piece, and I felt this visualization would be a good way to look deeper into its rich texture. This clip is taken from the finale of the ballet, which is now one of the most recognized melodies of the classical music genre.



Here, the strings of the orchestra play a quiet version of the melody. This gradually builds in intensity, as instruments such as the harp put a slight emphasis on each beat. This can be seen in the “pillars” created by this visualization.

A sweeping crescendo in the strings brings this selection to its climax, as the entire orchestra majestically enters. Note how the visualization becomes less clear at this moment, before it regains clarity once more

The timpani enters, providing a low, rumbling foundation upon which the orchestra builds.

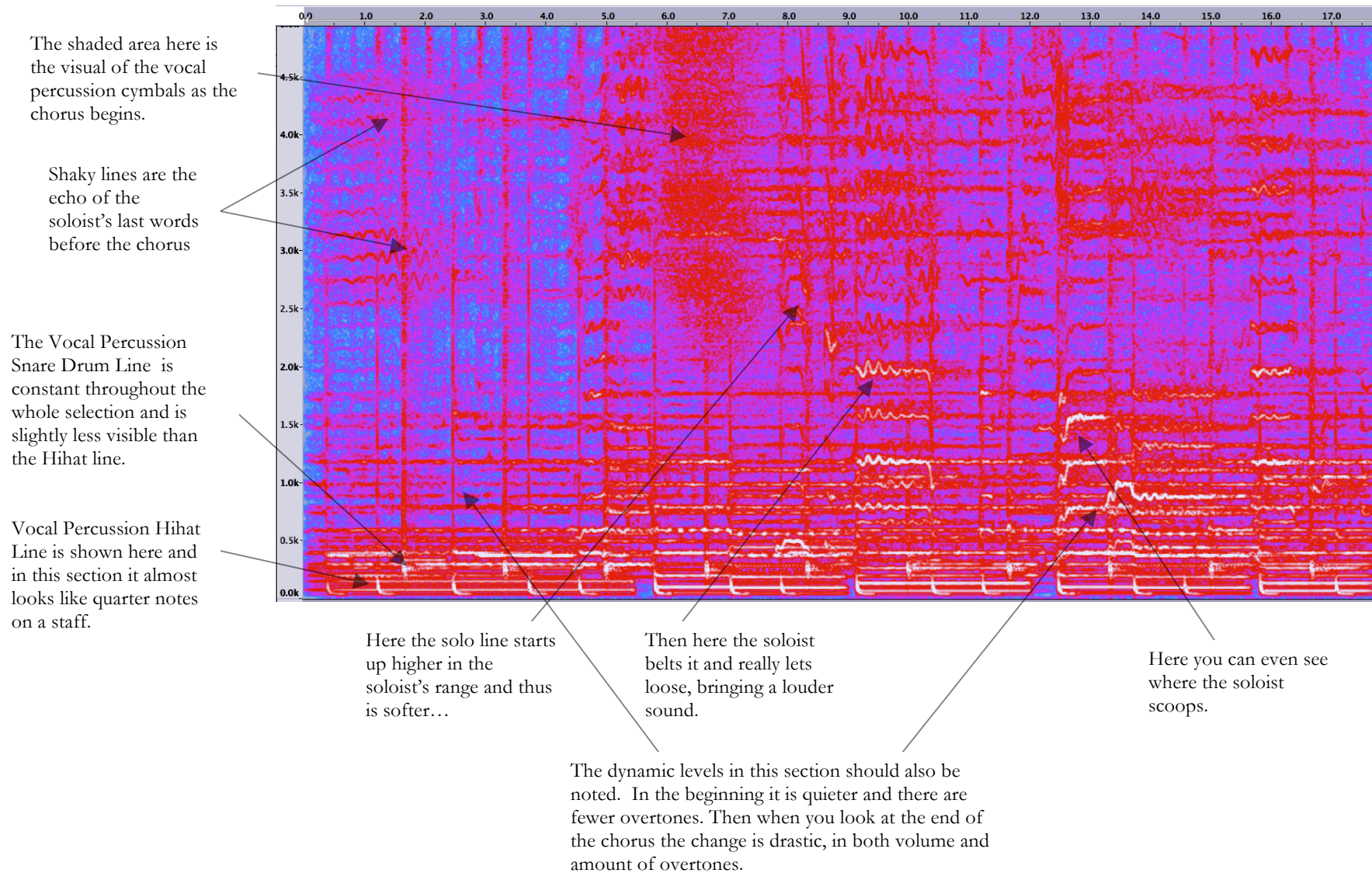
Each note the orchestra plays has a very heavy pulse, which can be seen here in even more pronounced visual pillars

The sound suddenly dies away, leaving only a few strings playing a repeating ascending and descending motive

City by The Rip Chords



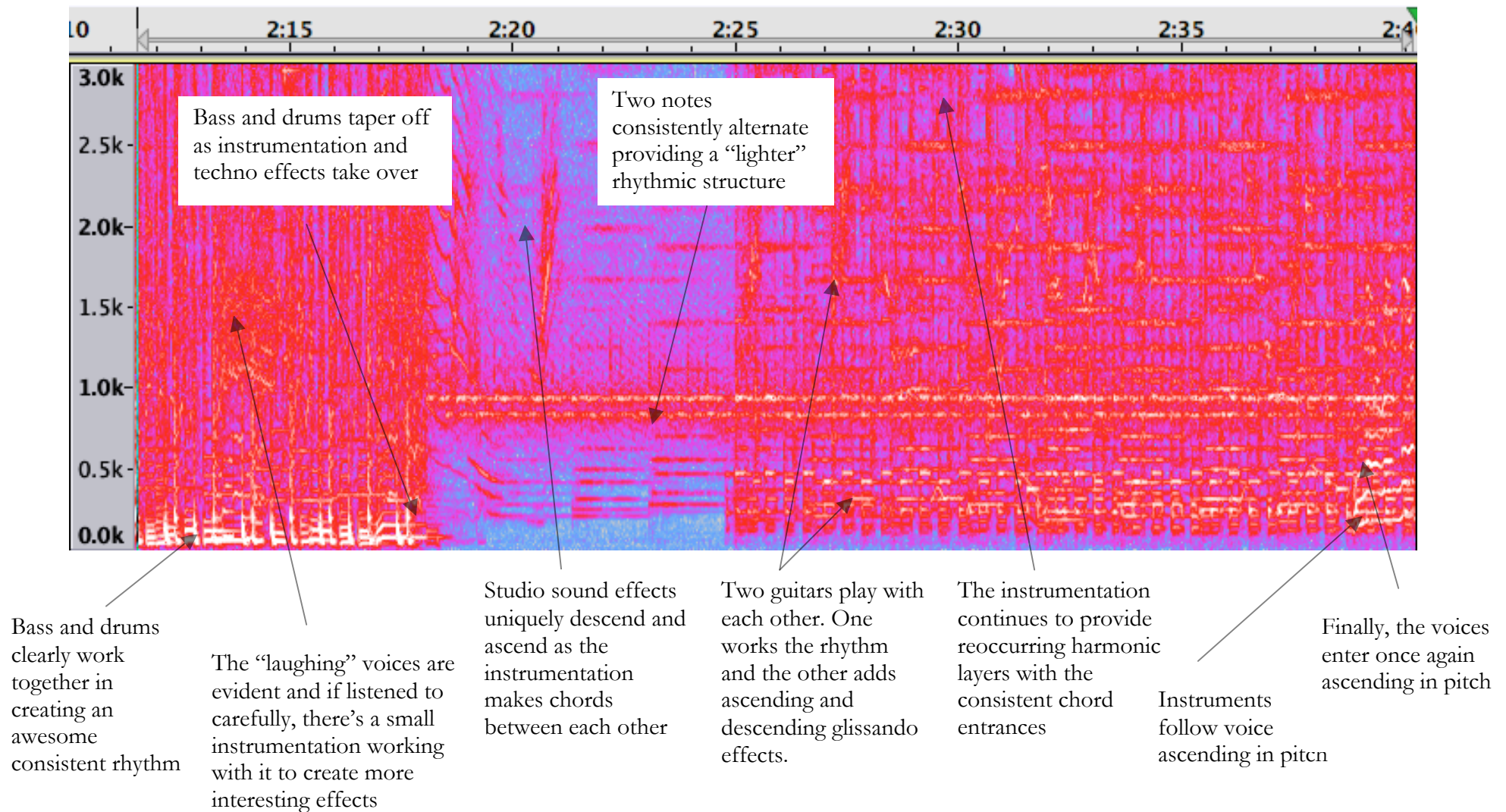
I chose this piece because I believed that it would be interesting to see how a picture of a spectrogram of an a capella piece would compare to that of other accompanied pieces. This song is an excellent example of why a capella music is so amazing; the young women's voices blend together excellently, there are beautiful harmonies, and they are the talent that recreates all the sounds including the percussion with voices alone. This particular section is about 18 seconds long and is the ending of the verse and the chorus.



Feel Good Inc. by Gorillaz



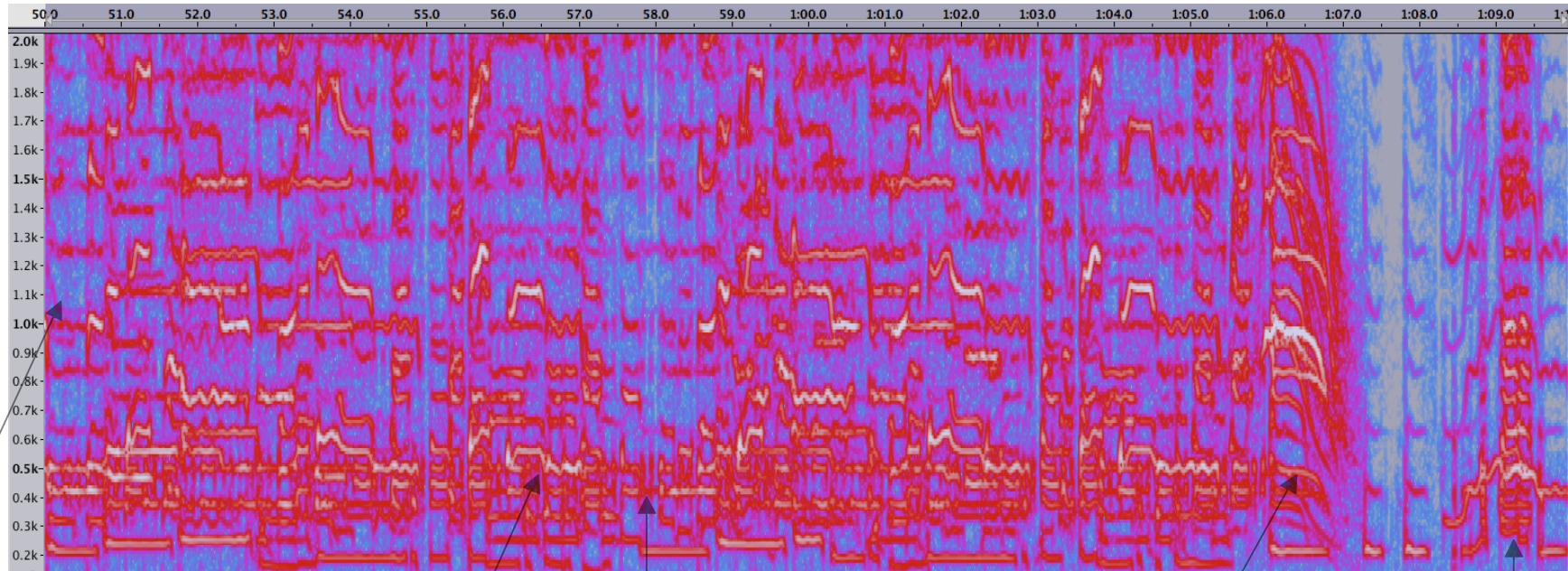
At first, I wanted to do a visualization of a classical piece because of my career path as a classical harp performance major and string music educator. I changed my mind after realizing the fact that I academically listen to and analyze classical music all the time and maybe it would be more interesting if I chose a song in a different genre of music. *Feel Good Inc.* by Gorillaz is the just the song I was looking for. This song has a collaboration of interesting musical effects/genres including instrumentation, rap, and techno effects. The segment I selected from the song includes many of these effects in which I have discovered to be evident on the spectrograph visualization.



Rocksteady by Marc Broussard (performed by The Rip Chords)



This is a recording of my a cappella group, The Rip Chords. I think it is an interesting selection because all the sounds made on the recording are voices imitating the sound of instruments. This song provides has some cool elements to analyze on the spectrum, including a vocal “fall”, distinct pitch contours, and rhythmic variations.



This arrow to the left of the spectrum shows rhythmic variation in the voice parts. If you look carefully at the spectrum horizontally, you can see that at least one voice part (from high to low) is moving or articulating at any given time.

There is a drastic difference in texture between these two arrows. The one on the left is indicating the “meat” of the chorus. Some voice parts are singing the words of the melody, some are singing notes in the chords of the melody. The second arrow indicates the transition between phrases in the chorus. Most of the voices drop out but the bass/low alto continues.

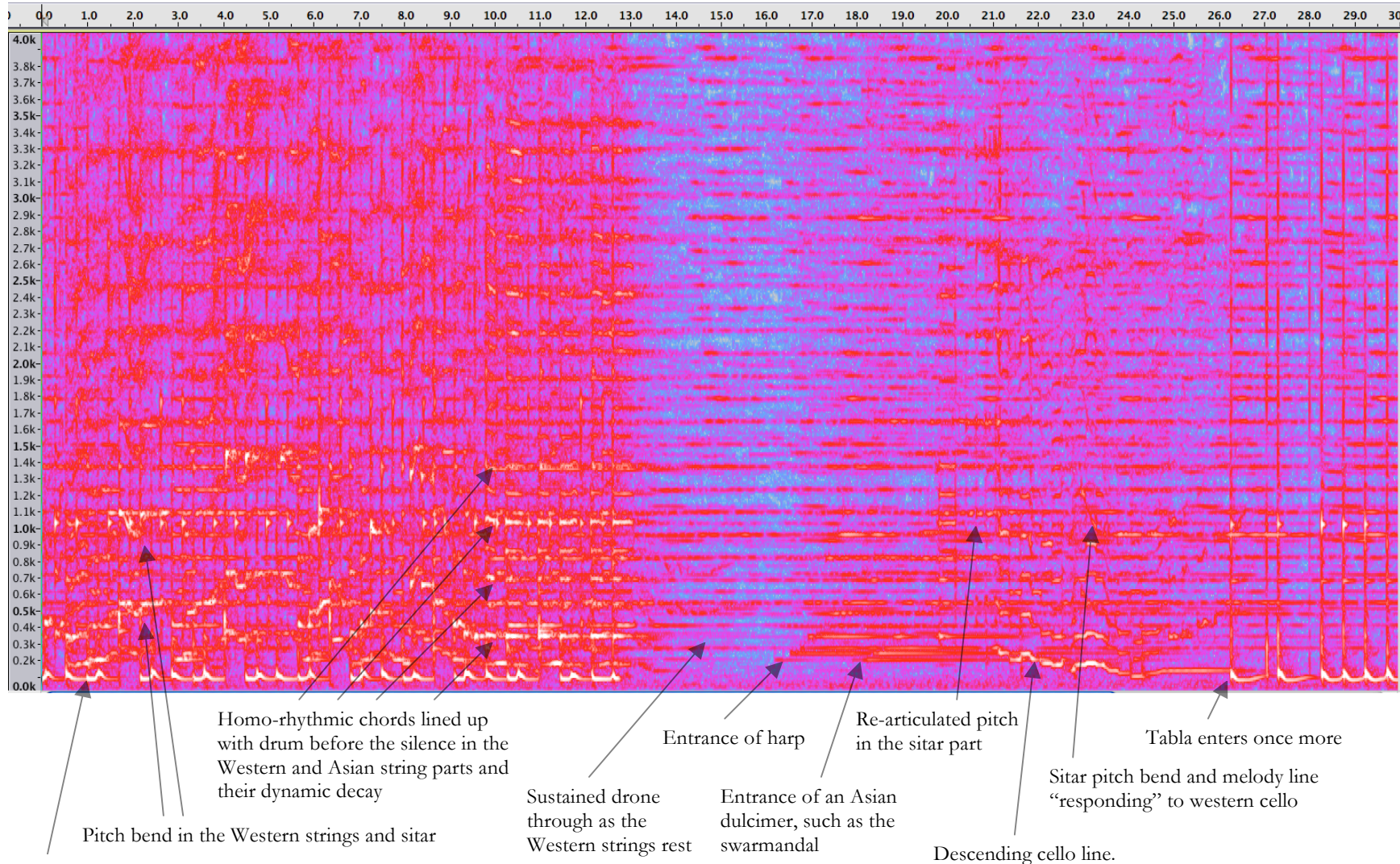
Here is the vocal “fall”. This “fall” is in all the voices from low to high as seen in the spectrum. The fall is followed by two short notes. The spectrum shows their length with the blue color in between the pink notes.

This last arrow signifies the transition into the next verse. The pitch in the bass clearly moves up, then back down to tonic.



Within You Without You by The Beatles

I selected an excerpt of "Within You Without You" by the Beatles to analyze because of the many interesting timbres used such as the sitar, the tabla (the pitch changing drum) along with western strings. I thought this would be an interesting piece to analyze to teach the importance of the different timbres of an ensemble. In this regard I could use this example when I need to teach students the importance of muted trumpet in a certain section, or the concept of "ensemble color." I think the Spectrum also gives a very interesting visualization of some of the psychedelic elements of the piece.



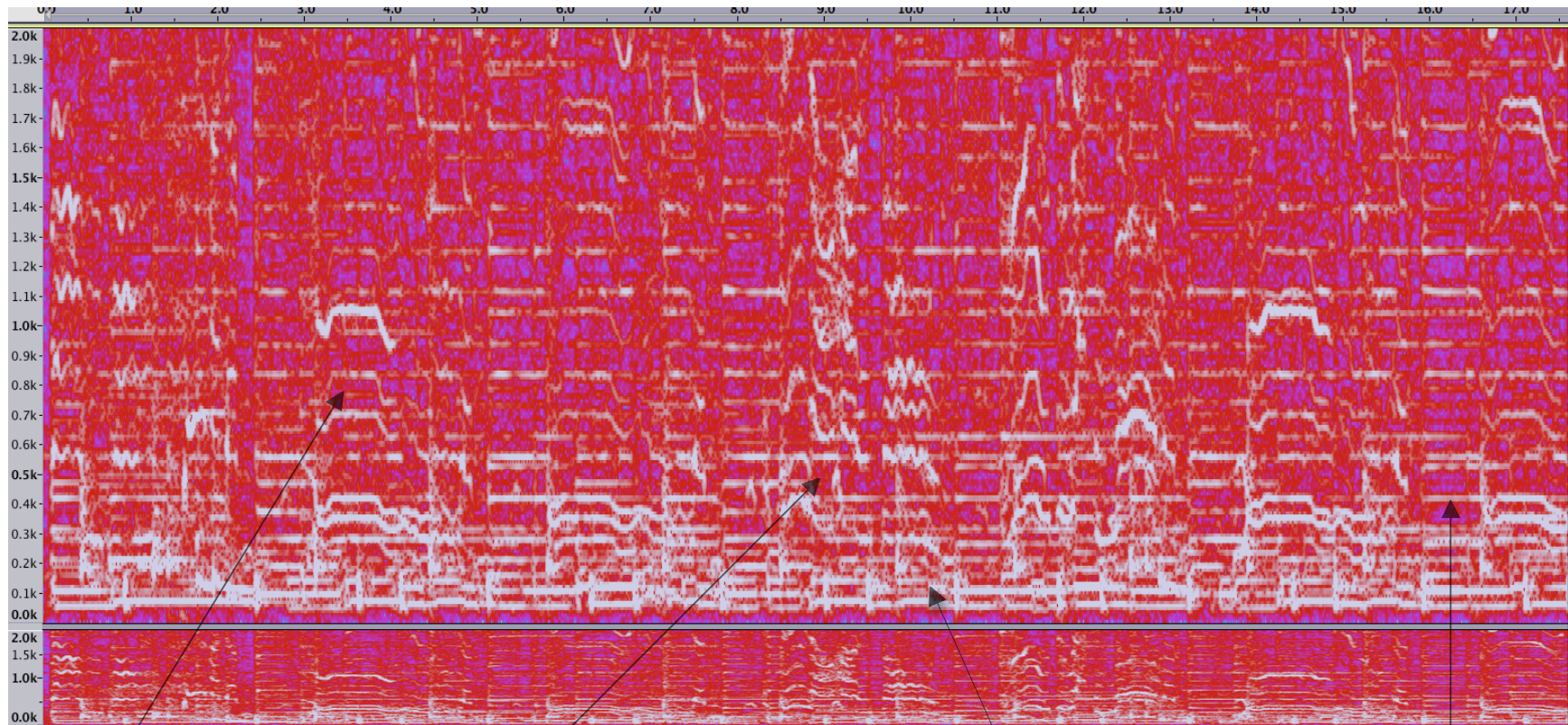
The scoop in pitch in the tabla (drum) line

© 2009 Visualization by Phil Kagan. Then insert audio recording copyright information in APA format as follows: Harrison, G. (1967). Within You Without You [Recorded by the Beatles]. On Sgt. Pepper's Lonely Hearts Club Band [Medium of recording: Originally Record]. United Kingdom: Parlophone.

Been There Before by Hanson



I choose to do a visualization of the piece of music, Been There Before by Hanson, because I think it is a very interesting piece. It is very basic in its instruments used and overall musical structure, but the style of the piece makes it interesting and unique. I picked this particular 30 seconds of the piece because it is in the chorus and has the most overlapping of things going on. All voices and instruments are present making the analysis of it more interesting and in-depth.



This is the first big chord of the song. The first chord of the chorus that has all voices singing and all instruments playing, it has the most layers and there for has the highest levels.

This is the point in the song where the voices of the instruments are pitched high and more overtones are released and heard. The human voices are also in harmony with each other, creating more overtones.

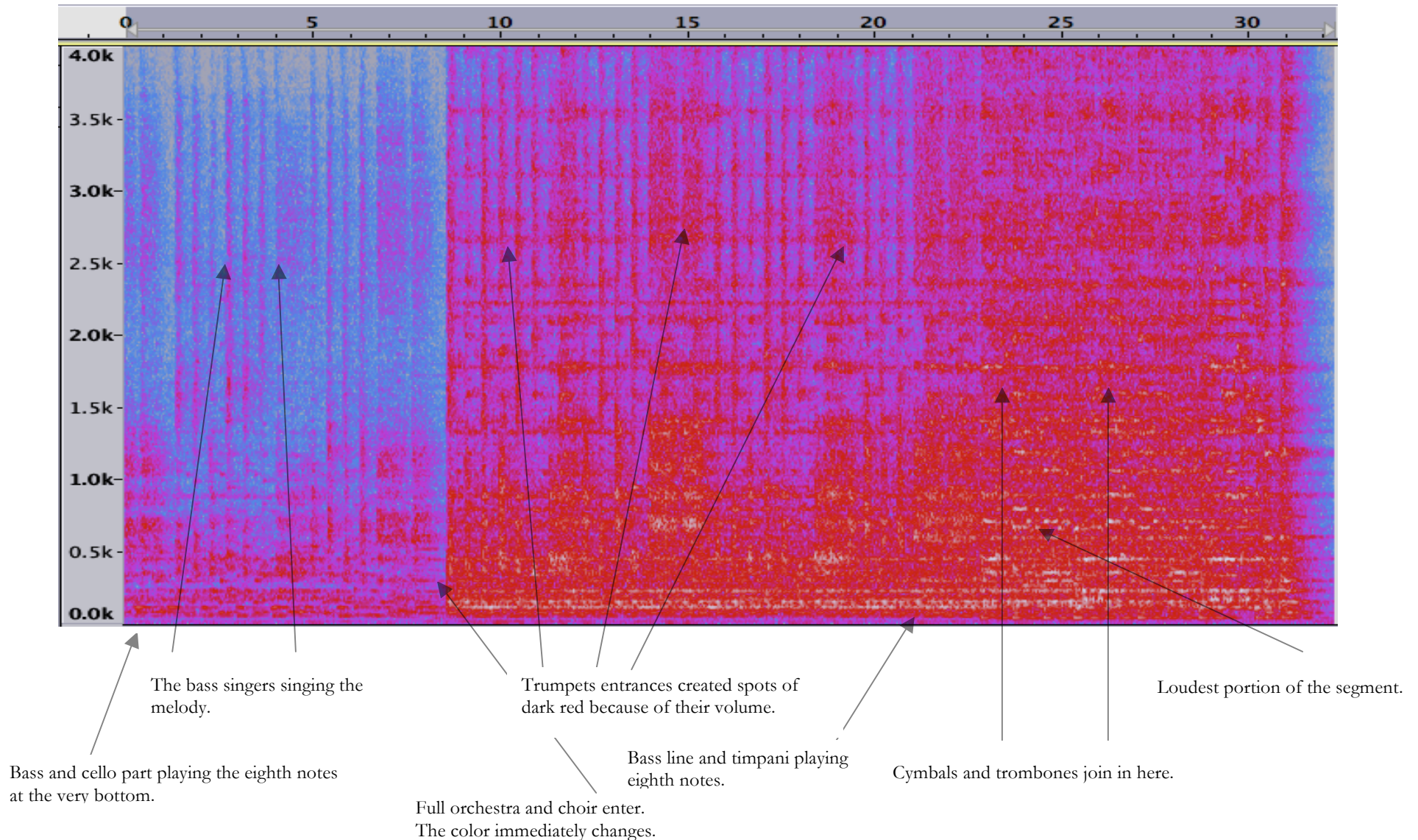
During excerpt of the piece the guitar line simply repeats every 4 bars. This keeps the bottom level of the visualization steady which is displayed by the mid to lower frequencies.

This is a moment in the song where all voices drop out and it is only instruments; guitar, drums, and piano. The levels are lower because the frequency of the instruments is not a high as the voices are.

Carmina Burana – Fortuna Imperatrix Mundi, Fortuna plango vulnera by Carl Orff



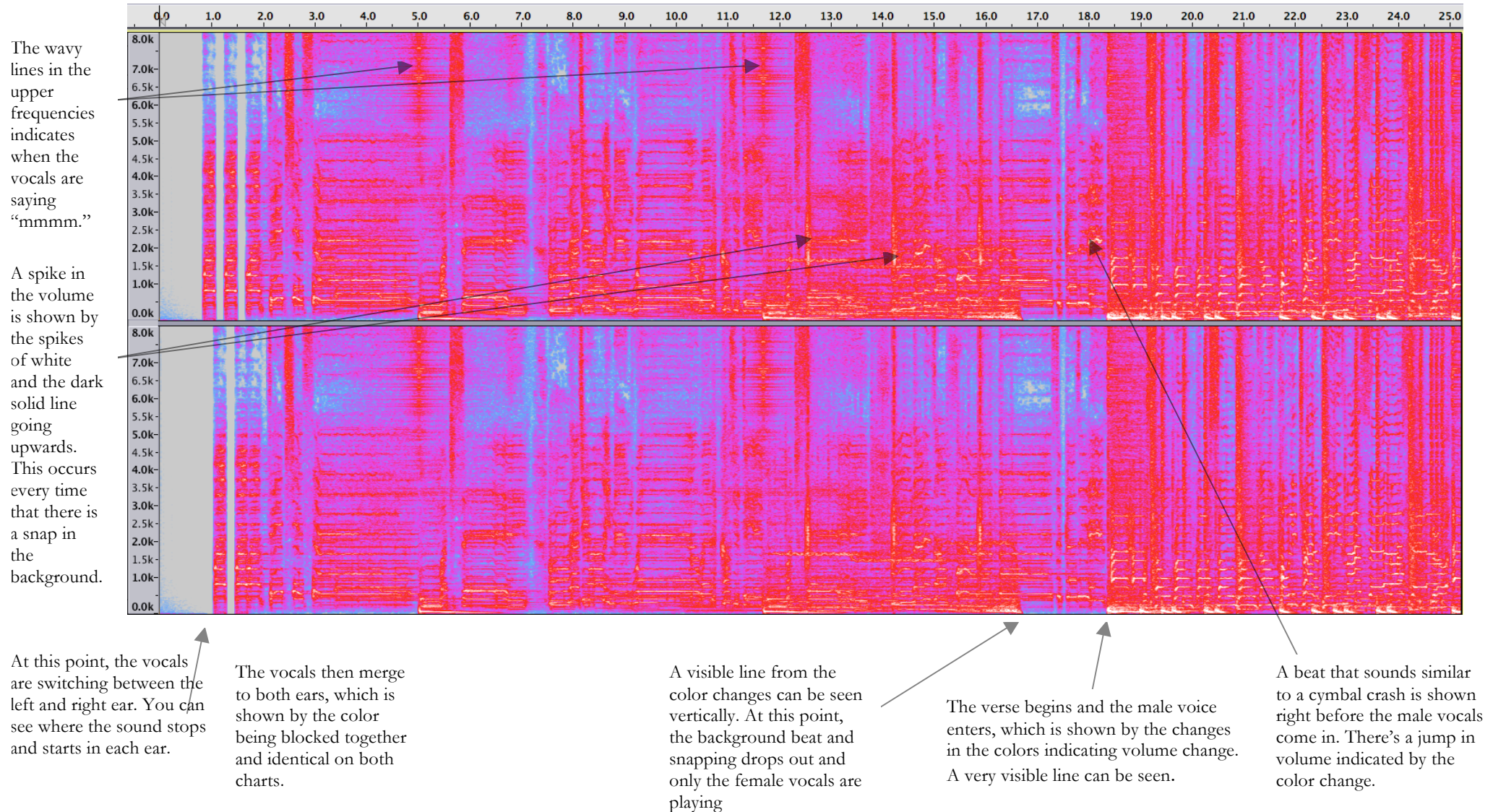
At this particular moment of the piece, the texts are “It is written in truth, that she has a fine head of hair, but, when it comes to seizing an opportunity, she is bald.” I chose this piece because Carmina Burana is one of the many pieces that I would like to perform in an orchestra. I believe that performing this song with a full chorus will probably be a once in a lifetime experience.



Whatcha Say by Jason Derulo



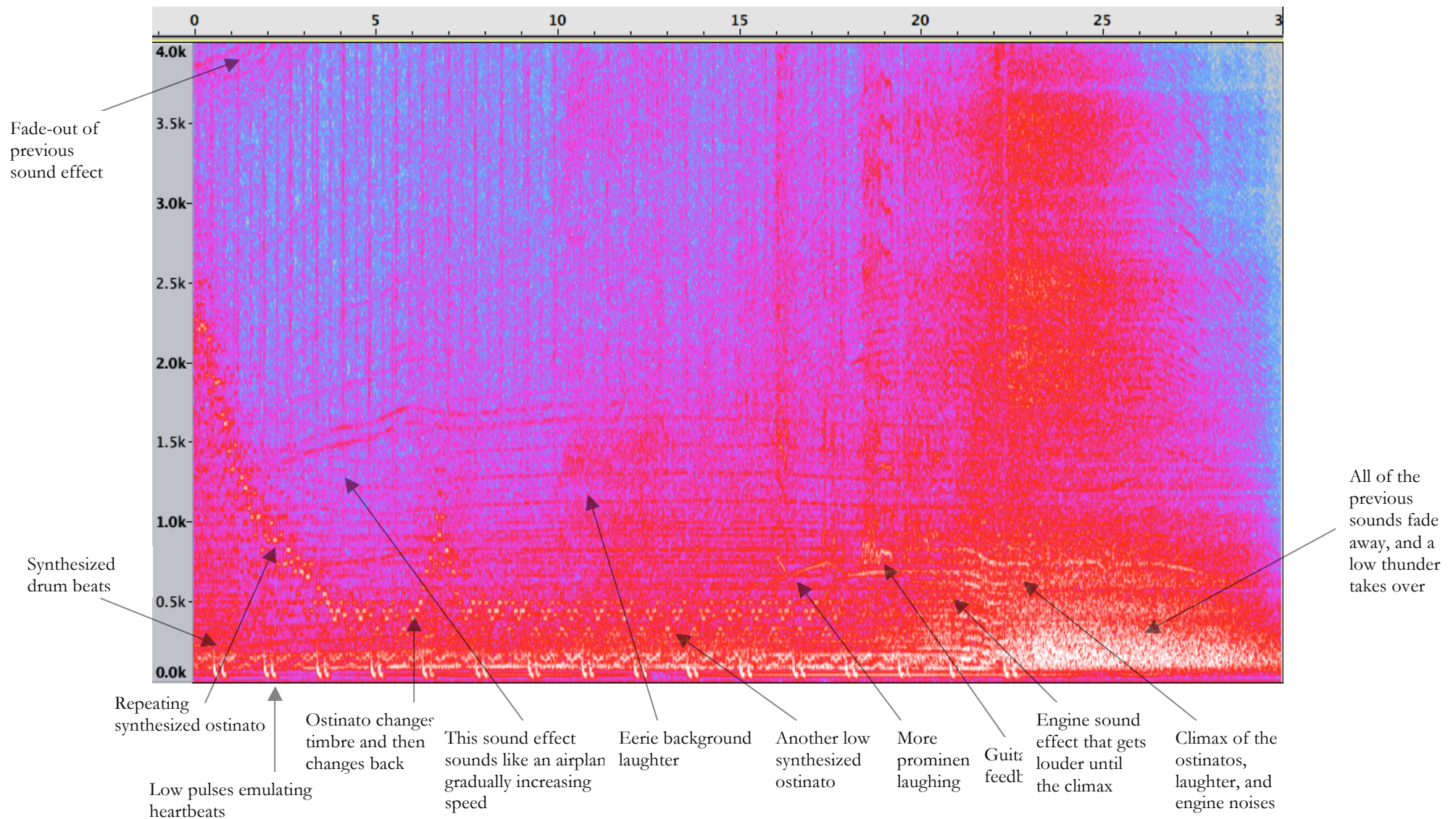
The “Whatcha Say” a capella opening, is a sound clip that has been used in various songs, originally created by Imogen Heap. I chose this song and this clip not only because I think it’s extremely catchy, but I thought it would make an interesting visualization. There are interesting aspects such as the switching between speakers, snapping in the background, and various voices.



On The Run By Pink Floyd



I chose to do my project on Pink Floyd's "On The Run" from their album *Dark Side of the Moon*. This album was released in 1973, and it has remained popular ever since its debut. This song demonstrates how Pink Floyd used lots of sound effects in their songs, which is clearly noted in the visualizer.

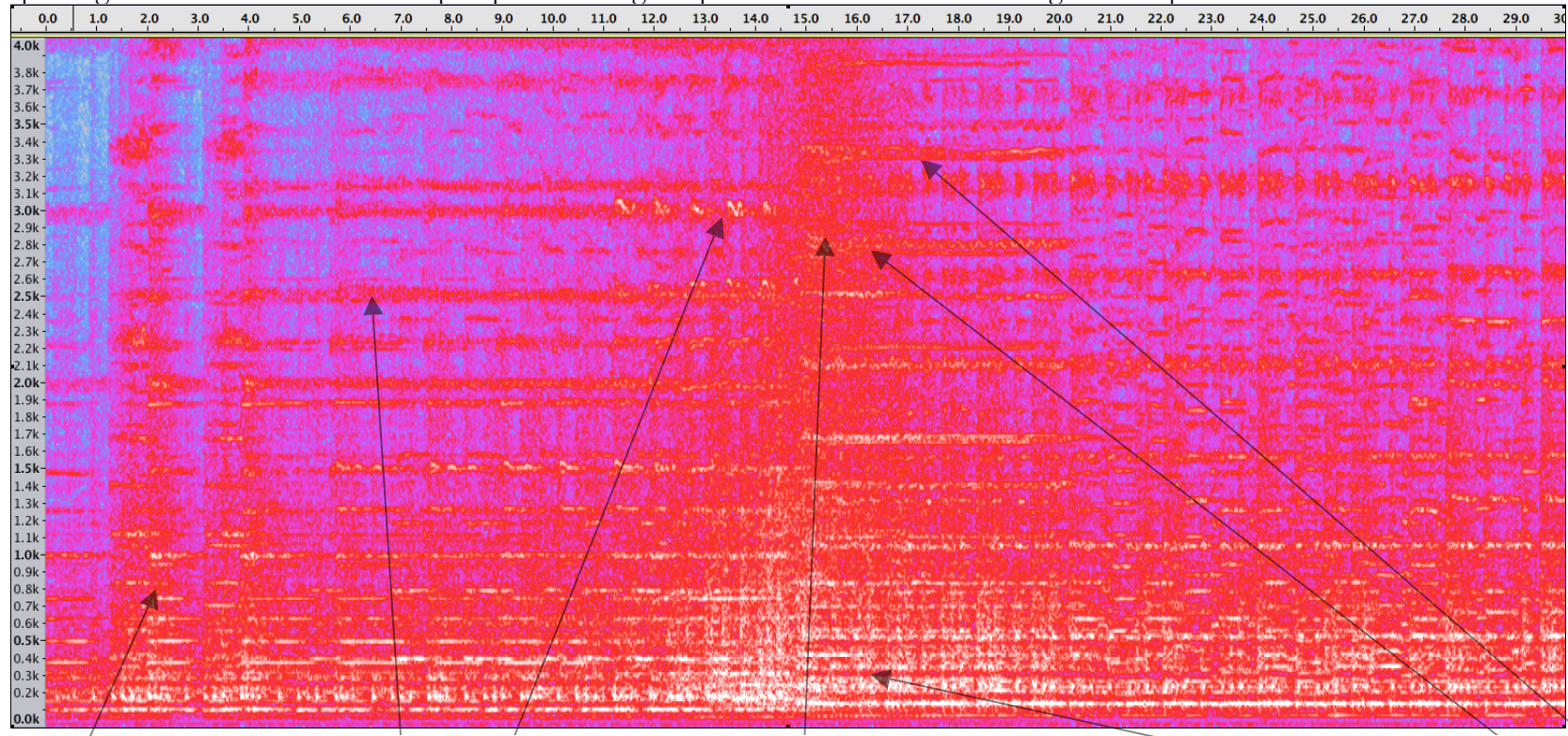


© 2009 Visualization by Alex Moroz. Gilmour, D. & Waters, R. (1990) "On The Run" [Recorded by A. Parsons]. *Dark Side of the Moon* [CD]. New York City, New York: Capitol. (Recorded 1972-1973).

Mars, The Bringer of War by Holst



This excerpt from “Mars, The Bringer of War” contains a great deal of contrast among instrumentation, dynamic levels and pitch frequencies. It is interesting to watch the spectrogram because as this section builds to its climax at the 15 second point, the individual melodies can be seen as they enter. I chose this piece because I was curious to see how all of these contrasts would be depicted on a spectrogram. I decided that this excerpt represented a good portion of the contrasts throughout the piece.



Here the maximum volume level of the crescendo is visible. As the music gets louder, the yellows and reds become thicker and more defined. At the peak of the crescendo, all of the instruments move to a lower pitch. This can be seen here as there are many sections of yellow that, at their strongest point, end and are continued a step lower on the spectrogram. Then, the yellow gradually fades in intensity as the instruments decrescendo.

Here the same group of notes in repeated by many instruments. As it is repeated, the duration of the final note becomes shorter and the volume is louder. As the duration of the final note becomes shorter, the vertical lines seen on the spectrogram are closer together. As the volume increases, there is more red and less blue, meaning that more overtones are present. By the end of this section, there are clearly defined yellow lines because the music is louder.

This is the climax of this part of the piece. The loud dynamic and use of many instruments can be seen because it is almost all reds and yellows and no blues. The lack of blue coloring shows that all of the overtones, which are viewed in this screen shot, are being utilized.

Throughout this whole excerpt, many of the lower voices have the same rhythmic pattern repeated. The rhythm can be seen in the thin red vertical lines in between yellow sections. Just as the rhythm is repeated throughout the song, the patten of vertical lines repeats in the lower voices on the spectrogram. At this point, the most instruments have the pattern because the pattern of yellow with red vertical lines is present in the most levels of the spectrogram.

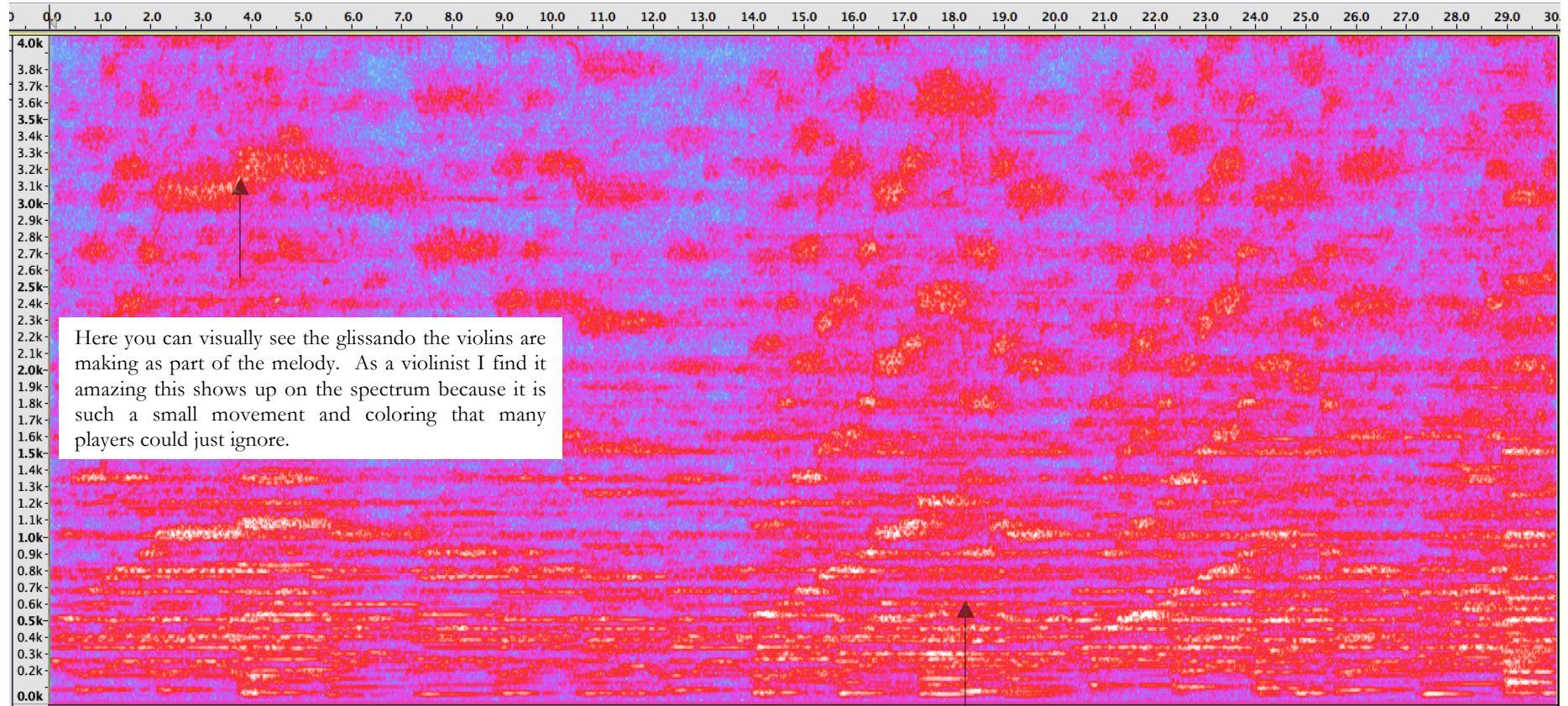
Here, many instruments sustain a long note. The thick red area with a small line of yellow can be seen in many different registers. The notes are held at one dynamic for a few seconds, and the coloring stays consistent. Then, as the notes decay, the yellow lines are less defined, to the point where there is only red and then the red decays, depicting the decrescendo of multiple instruments.

© 2009 Visualization by Jennifer Morrow. Holst, G. (1918). Mars, the Bringer of War [Recorded by The London Symphony Orchestra]. On Holst: The Planets [CD]. London: LSO. (2003).

Die Moldau by Bedrich Smetana



I chose this particular musical moment because I like how it shows the texture of a full orchestra. There is constant sound happening though these 30 seconds, but by using the spectrum to visually look at the sound produced you can make out individual voices and instruments that would be heard in the orchestra. I think this is a good example of how every person is important to an orchestra and contributes to the overall texture produced. I also like how the contours and nuances of the melody could clearly be seen in these 30 seconds, and even though the same notes are being played the spectrum can look drastically different because it sounds drastically different.



Here you can visually see the glissando the violins are making as part of the melody. As a violinist I find it amazing this shows up on the spectrum because it is such a small movement and coloring that many players could just ignore.

The strong pink lines here represent the cello's downbeats. The cello's continue with runs, but the downbeats are clearly stronger, which shows me that possibly the cellist were using these downbeats accents to make sure they stayed together during their runs. These strong downbeats continue through this entire musical moment.

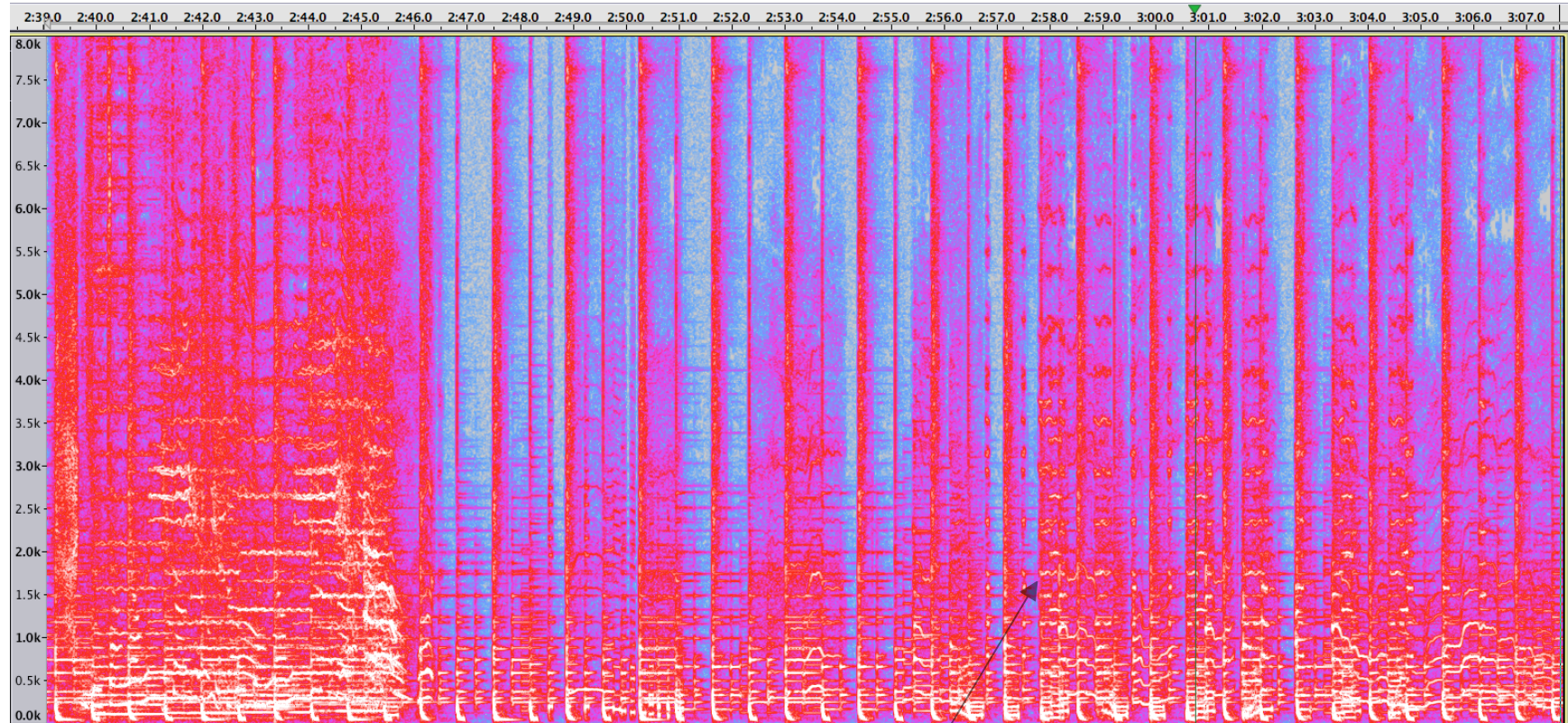
Here is the climax of this particular musical moment. Every player in the orchestra arrives at this point together as can be seen by the contour of this section. Even the bass instruments, which have not had much shape, join the shape of the orchestra to create this moment.

The contour is similar to the climax, but this time there is less pink the more vertical you go, showing that there are not as many overtones and the dynamics have greatly decreased, like an echo.

You Don't Know Me by Ben Folds (feat. Regina Spektor)



I thought it would be interesting to analyze a popular piece of music to see what I could learn from it. So often, classical examples are used to demonstrate musical techniques. I think as a future educator, it will be important to emphasize that there is much to be learned from any type of music, not just classical. This approach might also be more appealing to some students. I chose this specific excerpt because it features the chorus in its climax, both vocals, and the closing of the song. I think it is particularly interesting because it is a buildup to the end, gradually adding instruments, rather than closing by fading away.



Beginning here the chorus is restated for the final time. It is typical that this would be the climax of the piece because of the loud volume and thick texture. The intense red and purple colors show the thick texture of the piece. You can tell there isn't much empty space in the music because there are virtually no light blue spots for about the next 6 seconds.

The bright orange shows both voices joining together for the final and strongest statement of the lyrics.

Beginning of the buildup to the end. There is thin texture with only percussion and keyboards.

These orange lines represent the female vocals. She vocalizes sounds like 'ah' and 'oh'. As the syllable changes, the pitch, and orange line, bends up and down.

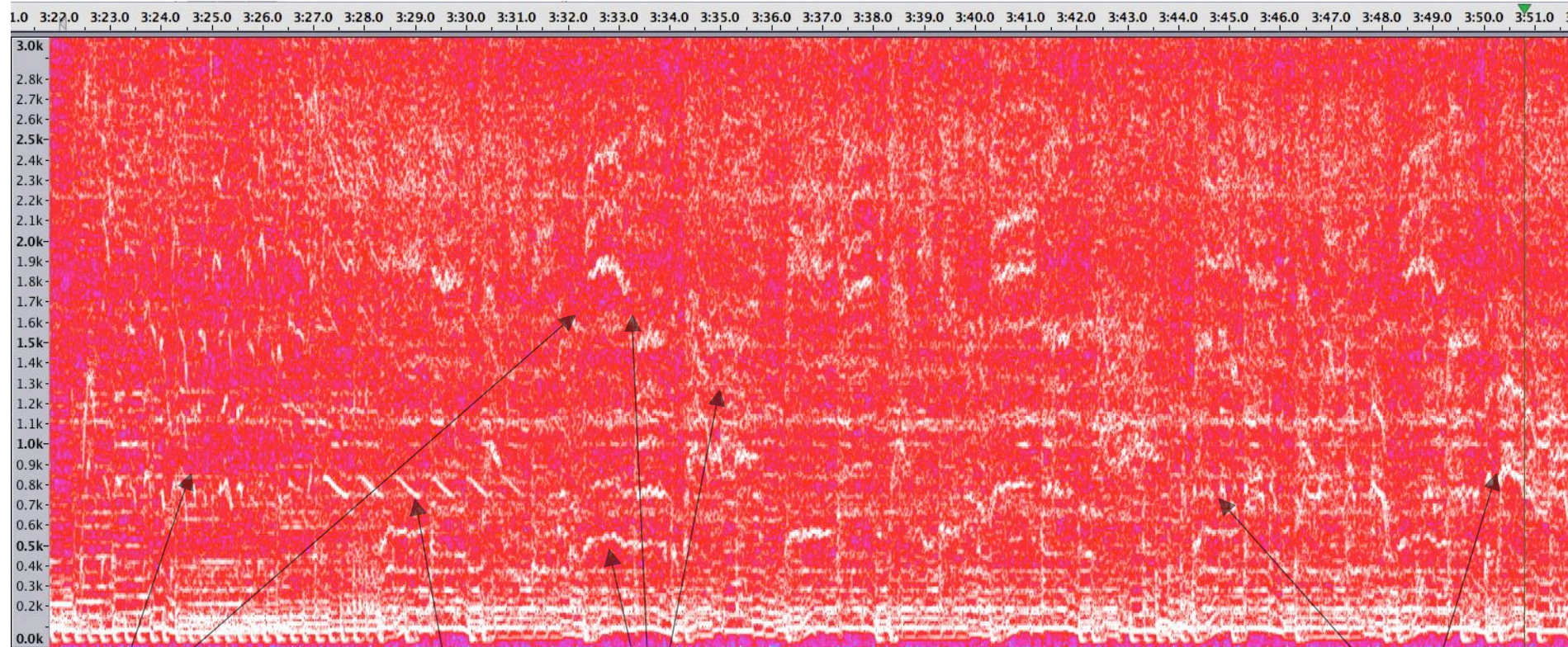
The buildup to the end is at full instrumentation. You can see the purple finally reaching the top of the spectrum once all the instruments join in.

Each "tick" of orange at the bottom of the visualization shows the strong beats from the drum set on beats 1 and 3 of every measure.

Patterns by Tony Iommi (Feat. Serj Tankian of System of a Down)



I wanted to analyze this song particularly for a few reasons. I enjoy System of a Down so much because of their interesting mesh of heavy metal instrumental riffs and vocal harmony. Serj Tankian brings that style into sync with Tony Iommi's heavy guitar riffs in this song and I was curious to see how it would play out in a visual format. Patterns did not disappoint. This 30 second clip shows very well the interesting blend of styles that comes from collaboration between the System of a Down front man and the Black Sabbath guitarist.



Scattered, unpredictable pattern shown here is a segment where the singer shouts a phrase rather than sing it. Noticeable pattern returns when singing re-enters.

Notice overtones changing with vocal syllables and style of singing (open vs. strained.) Also notice use of wide vibrato.

These diagonal dashes represent the end of the shouting. Also, the last word, "day" is echoed. Notice it slowly decays until the vocals re-enter.

These dots along the very bottom of the spectrum are bass drum hits. Directly above them the constant line of the bass guitar, and just above that, the guitar. Parts provide solid groundwork for the song.

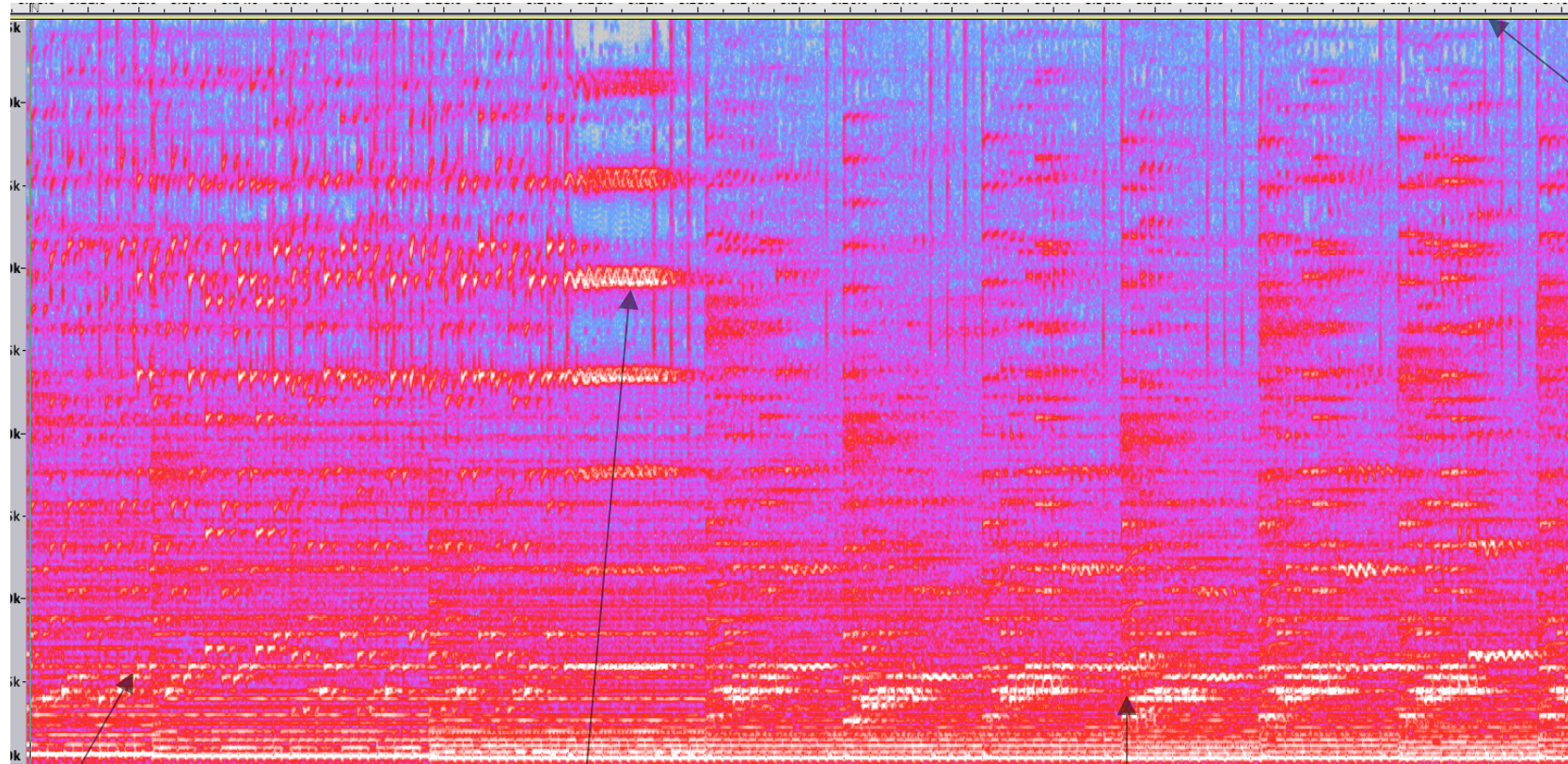
Texture thickens noticeably here as new vocal line is added in and layered over what we have already heard.

© 2009 Visualization by David Roush. Then insert audio recording copyright information in APA format as follows: Iommi, T; Tankian, S; Marlette B. (2000). "Patterns." On album "Iommi." [Medium of Recording: CD]. Divine Records/Priority Records. (Recorded: 1996-2000).

Waterwings by Mark Bunce



I chose *Waterwings* because it includes many interesting textures that I do not think many people have heard. This piece is written for Alto Saxophone and interactive computer, so there are many times when the listener hears multiple saxophones and rhythms all at once even though there is only one saxophonist on stage. This is a clip from the middle section of the piece where the music is building to the climax. I chose this section because it shows a part of the piece that has a lot going on and shows off the possibilities of using a computer as an accompaniment.



These red bars that extend to the top are the drum sounds of the computer.

We can see many layers of the phrase that make it sound like there is more than one player here.

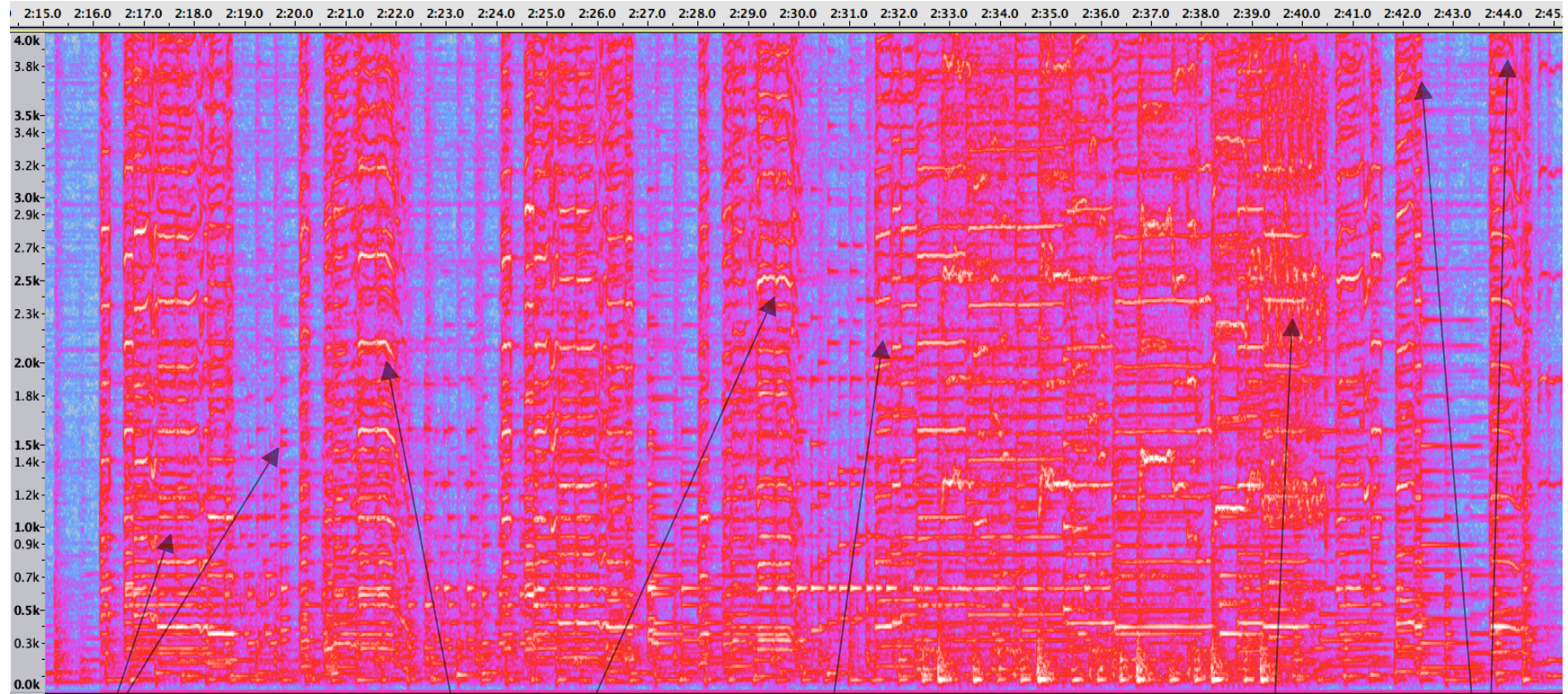
This is the only part in this section where there is really only one thing going on. Not only does it seem like both saxophone and computers are playing the same note, but there is also an effect added to the sound. That effect is reverb and can be seen by two different shades of yellow here.

This is the start of the 4th time through this repeated part. We can see that there is a line that extends all the way up and down. This shows that a lot of the tones and pitches from the computer decrescendo and die down and then are immediately picked back up all at the same time.

Don't Take Your Love From Me by Maynard Ferguson



As a trumpet player I have a sweet spot in my heart for the many works of Maynard Ferguson. Thus, I thought it would be interesting to visually see the difference in the sound between the orchestra and the sizzling, jazzy sounds coming from Maynard's trumpet.



As the groove of the piece starts and the solo trumpet hasn't come in yet, you can see the steady pulse that the orchestra and bass line has created. The spaces between and of the pink to blue section are very consistent.

These are the secondary trumpets player's falls as they set up the groove for Maynard.

Here is where the trumpet first comes in. Notice the drastic change in pink and red when Maynard enters the ensemble. You can also see that the overtones range much higher because of the incredible range he amplifies.

This is Maynard Ferguson's shake.

You can see, especially towards the end, that whenever the trumpets are playing with the ensemble they help create more overtones than there were previously. Thus it is much busier and darker towards the top.